Complete Summary

GUIDELINE TITLE

Bacterial keratitis.

BIBLIOGRAPHIC SOURCE(S)

Cornea/External Disease Panel, Preferred Practice Patterns Committee. Bacterial keratitis. San Francisco (CA): American Academy of Ophthalmology (AAO); 2005. 20 p. [60 references]

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: American Academy of Ophthalmology (AAO). Bacterial keratitis. San Francisco (CA): American Academy of Ophthalmology (AAO); 2000 Sep. 25 p.

All Preferred Practice Patterns are reviewed by their parent panel annually or earlier if developments warrant and updated accordingly. To ensure that all Preferred Practice Patterns are current, each is valid for 5 years from the "approved by" date unless superseded by a revision.

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SCOPE

DISEASE/CONDITION(S)

Bacterial keratitis

GUIDELINE CATEGORY

Diagnosis
Evaluation
Management
Treatment

CLINICAL SPECIALTY

Ophthalmology

INTENDED USERS

Health Plans
Physicians

GUIDELINE OBJECTIVE(S)

To minimize visual loss, relieve pain, eliminate the infectious agent, and minimize structural damage to the cornea by addressing the following goals:

- Recognize and reduce risk factors that predispose patients to bacterial infection of the cornea
- Establish the diagnosis of bacterial keratitis, differentiating it from other causes of keratitis
- Utilize appropriate diagnostic tests
- Deliver appropriate therapy
- Relieve pain
- Prevent complications, such as intraocular infection, cataract, perforation, and loss of vision
- Educate patients and their families about treatment and ways to reduce risk factors in the future

TARGET POPULATION

Individuals of all ages who present with symptoms and signs suggestive of bacterial keratitis

INTERVENTIONS AND PRACTICES CONSIDERED

Diagnosis/Evaluation

1. Comprehensive eye evaluation, including detailed history and examination (e.g., visual acuity, external examination, slit-lamp biomicroscopy)
2. Diagnostic tests (e.g., cultures and smears, corneal biopsy)
3. Follow-up evaluation

Treatment/Management

1. Antibiotics (topical drops and ointments, subconjuntival, systemic)
2. Corticosteroid therapy
3. Patient education
4. Referral to specialist for visual rehabilitation, if indicated

MAJOR OUTCOMES CONSIDERED

- Rate of disease progression
- Effectiveness of treatments
- Adverse effects of treatments

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

In the process of revising this document, a detailed literature search of MEDLINE for articles in the English language was conducted on the subject of bacterial keratitis for the years 2000 to February 2005.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Ratings of Strength of Evidence

- Level I includes evidence obtained from at least one properly conducted, well-designed randomized, controlled trial. It could include meta-analyses of randomized controlled trials.
- Level II includes evidence obtained from the following:
    - Well-designed controlled trials without randomization
    - Well-designed cohort or case-control analytic studies, preferably from more than one center
    - Multiple-time series with or without the intervention
- Level III includes evidence obtained from one of the following:
    - Descriptive studies
    - Case reports
    - Reports of expert committees/organization
    - Expert opinion (e.g., Preferred Practice Pattern panel consensus)

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The results of a literature search on the subject of bacterial keratitis were reviewed by the Cornea/External Disease Panel and used to prepare the recommendations, which they rated in two ways. The panel first rated each recommendation according to its importance to the care process. This "importance to the care process" rating represents care that the panel thought would improve the quality of the patient's care in a meaningful way. The panel also rated each recommendation on the strength of the evidence in the available literature to support the recommendation made.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Ratings of Importance to the Care Process

Level A, most important
Level B, moderately important
Level C, relevant, but not critical

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

These guidelines were reviewed by Council and approved by the Board of Trustees of the American Academy of Ophthalmology (September 2005).

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Ratings of importance to the care process (A-C) and ratings of strength of evidence (I-III) are defined at the end of the "Major Recommendations" field.

<u>Diagnosis</u>

History

Obtaining a detailed history is important in evaluating patients with bacterial keratitis. Pertinent information includes the following:

- Ocular symptoms [A:III] (e.g., degree of pain, redness, discharge, blurred vision, photophobia, duration of symptoms, circumstances surrounding the onset of symptoms)
- Review of prior ocular history, [A:III] including risk factors such as contact lens wear, [A:II] swimming or using a hot tub while wearing contact lenses, herpes simplex virus keratitis, herpes zoster virus keratitis, previous bacterial keratitis, previous ocular surgery including refractive surgery, trauma, and dry eye
- Review of other medical problems [A:III]
- Current ocular medications and medications recently used [A:III]
- Medication allergies [A:III]

Examination

Visual Acuity

In many cases, patient discomfort, tearing, and inflammation will compromise visual acuity. It is useful, however, to document baseline visual acuity and to ascertain that it is consistent with the anterior segment examination. [A:III]

External Examination

An external examination should be performed with particular attention to the following:

- General appearance of the patient including skin conditions [B:III]
- Facial examination [B:III]
- Eyelids and lid closure [A:III]
- Conjunctiva [A:III]
- Nasolacrimal apparatus [B:III]
- Corneal sensation [A:III]

Slit-Lamp Biomicroscopy

Slit-lamp biomicroscopy should include evaluation of the following:

- Eyelid margins: [A:III] inflammation, ulceration, eyelash abnormalities including trichiasis, irregularities, lacrimal punctal anomalies
- Conjunctiva: [A:III] discharge, inflammation, morphologic alterations (e.g., follicles, papillae, cicatrization, keratinization, membrane, pseudomembrane, ulceration, prior surgery), ischemia, foreign bodies, filtering blebs
- Sclera: [A:III] inflammation (e.g., infectious versus autoimmune), ulceration, scarring/thinning, nodules, ischemia
- Cornea: [A:III] epithelium, including defects and punctate keratopathy, edema; stroma, including ulceration, thinning, perforation, and infiltrate (location [central, peripheral, perineural, surgical, or traumatic wound], density, size, shape [ring], number [satellite], depth, character of infiltrate margin [suppuration, necrosis, feathery, soft, crystalline], color), edema;

endothelium; foreign bodies, including sutures; signs of corneal dystrophies (e.g., epithelial basement membrane dystrophies); previous corneal inflammation (thinning, scarring, or neovascularization); signs of previous corneal surgery (e.g., corneal transplantation, radial keratotomy, astigmatic keratotomy or limbal relaxing incision, LASIK, or other refractive surgery)
- Anterior chamber: [A:III] depth; inflammation, including cell and flare, hypopyon, fibrin, hyphema
- Anterior vitreous; [A:III] presence of inflammation

Clinical features suggestive of bacterial keratitis include dense suppurative stromal infiltrate (particularly those greater than 1 mm in size) with indistinct edges, edema, and white cell infiltration in surrounding stroma. An epithelial defect is typically present. An anterior chamber reaction is often seen.

Diagnostic Tests

Cultures and Smears

- Smears and cultures are indicated in cases with a corneal infiltrate that is large and extends to the middle to deep stroma, that is chronic in nature or unresponsive to broad spectrum antibiotic therapy, or that has clinical features suggestive of fungal, amoebic, or mycobacterial keratitis (Wilhelmus et al., 1994). [A:III]
- The hypopyon that occurs in eyes with bacterial keratitis is usually sterile, and aqueous or vitreous taps should not be performed unless there is a high suspicion of microbial endophthalmitis. [A:III]
- Prior to initiating antimicrobial therapy, cultures are indicated in sight-threatening or severe keratitis of suspected microbial origin. [A:III]
- Corneal scrapings for culture should be inoculated directly onto appropriate culture media in order to maximize culture yield (see Appendix 2 in the original guideline document) (Waxman et al., 1999). [A:III] If this is not feasible, specimens should be placed in transport media (Kaye et al., 2003). [A:III] In either case, cultures should be immediately incubated or taken promptly to the laboratory. [A:III] Cultures of contact lenses, lens case, and solution may be useful in situations where acanthamoeba is suspected or corneal cultures are negative. The material for smear is applied to clean class microscope slides in an even thin layer (see Appendix 3 in the original guideline document for specific diagnostic stains).

Corneal Biopsy

- Corneal biopsy may be indicated if there has been a lack of response to treatment or if cultures have been negative on more than one occasion and the clinical picture continues to strongly suggest an infectious process. It may also be indicated if the infiltrate is located in the mid or deep stroma with overlying uninvolved tissue.
- The biopsy specimen should be delivered to the laboratory in a timely fashion. [A:III]

Treatment

Initial

- Topical antibiotic eye drops are capable of achieving high tissue levels and are the preferred method of treatment in most cases. [A:III] Ocular ointments may be useful at bedtime in less severe cases and also may be useful for adjunctive therapy.
- Subconjunctival antibiotics may be helpful where there is imminent scleral spread or perforation or in cases where adherence to the treatment regimen is questionable. Systemic therapy may be useful in cases of scleral or intraocular extension of infection or systemic infection such as gonorrhea. Collagen shields or soft contact lenses soaked in antibiotics are sometimes used and may enhance drug delivery. They may also be useful in cases where there is an anticipated delay in initiating appropriate therapy, but these modalities have not been fully evaluated in terms of the potential risk for inducing drug toxicity.
- Topical broad-spectrum antibiotics are used initially in the empiric treatment of bacterial keratitis [A:III] (see Table 2 in the original guideline document). For severe keratitis (e.g., deep stromal involvement or a defect larger than 2 mm with extensive suppuration), a loading dose every 5 to 15 minutes for the first hour, followed by applications every 15 minutes to 1 hour around the clock, is recommended. [A:III] For less severe keratitis, a regimen with less frequent dosing is appropriate. Cycloplegic agents may be used to decrease synechia formation and to decrease pain in more severe cases of bacterial keratitis and are indicated when significant anterior chamber inflammation is present.
- Systemic antibiotics are rarely needed, but may be considered in severe cases where the infectious process has extended to adjacent tissues (e.g., the sclera) or when there is impending or frank perforation of the cornea. Systemic therapy is necessary in cases of gonococcal keratitis. [A:III]
- Frequency of re-evaluation of the patient with bacterial keratitis depends on the extent of disease, but severe cases (e.g., deep stromal involvement or larger than 2 mm with extensive suppuration) initially should be followed at least daily until clinical improvement or stabilization is documented. [A:III]

Modification of Therapy

- In general, the initial therapeutic regimen should be modified when the eye shows a lack of improvement or stabilization within 48 hours. [A:III] Keratitis due to Pseudomonas and other gram-negative organisms may exhibit increased inflammation during the first 24 to 48 hours despite appropriate therapy. Several clinical features suggest a positive response to antibiotic therapy:
    - Reduction in pain
    - Reduced amount of discharge
    - Lessened eyelid edema or conjunctival injection
    - Consolidation and sharper demarcation of the perimeter of the stromal infiltrate
    - Decreased density of the stromal infiltrate in the absence of progressive stromal loss
    - Reduced stromal edema and endothelial inflammatory plaque
    - Reduced anterior chamber cell, fibrin, or hypopyon
    - Initial re-epithelialization
    - Cessation of progressive corneal thinning

- Modification of therapy may mean a change in the type, concentration, or frequency of antibiotic treatment. Adjunctive therapy such as a temporary or permanent tarsorrhaphy may also be considered.
- Topical therapy is tapered according to clinical response, taking into account the severity of the initial clinical picture and the virulence of the pathogen. Specific tapering recommendations are difficult to make, due to wide variability in the severity of the infectious process in individual cases. Factors that may mandate more prolonged therapy include the presence of virulent or indolent organisms or presence of immunocompromise.

Indications for Reculture

Lack of a favorable clinical response, particularly in the setting of negative culture results, suggest the need for reculture and/or biopsy.

Corticosteroid Therapy

- Topical corticosteroid therapy may have a beneficial role in treating some cases of infectious keratitis.
- Patients being treated with ocular topical corticosteroids at the time of presentation of suspected bacterial keratitis should have their corticosteroid regimen reduced or eliminated until the infection has been controlled. [A:III]
- The objective in topical corticosteroid therapy is to use the minimum amount of corticosteroid required to achieve control of inflammation. Successful treatment requires optimal timing, careful dose regulation, use of adequate concomitant antibacterial medication, and close follow-up. Patient compliance is essential, and the intraocular pressure must be monitored frequently. The patient should be examined within 1 to 2 days after initiation of topical corticosteroid therapy. [A:III]

Therapy for Complicated Cases

- Additional treatment is necessary in cases where the integrity of the eye is compromised, such as an extremely thin corneal surface, or impending or frank perforation, or where there is progressive or unresponsive disease or endophthalmitis. Application of tissue adhesive, lamellar keratoplasty, and penetrating keratoplasty are among the treatment options.

Provider and Setting

- The diagnosis and management of patients with bacterial keratitis require the clinical training and experience of an ophthalmologist because the disease has the potential to cause visual loss or blindness and because the ophthalmologist is familiar with medical conditions associated with bacterial keratitis. [A:III] Severe cases, or those that fail to respond to treatment, may be best managed by an ophthalmologist who has extensive expertise with bacterial keratitis.
- The majority of patients with bacterial keratitis can be treated on an outpatient basis. Hospitalization may be necessary if the keratitis is severe or vision threatening, if compliance is impractical, or if pain is severe.

Counseling/Referral

- Patients and care providers should be educated about the destructive nature of bacterial keratitis and the need for strict adherence to the therapeutic regimen. [A:III]
- The possibility of permanent visual loss and need for future visual rehabilitation should be discussed. [A:III]
- Patients who wear contact lenses should be educated about the increased risk of infection associated with contact lens wear, overnight wear, and the importance of adherence to techniques that promote contact lens hygiene (Larkin, Kilvington, & Easty, 1990; Stern, 1998). [A:III]
- Patients with significant visual impairment or blindness should be referred for vision rehabilitation if they are not candidates for surgical visual rehabilitation (American Academy of Ophthalmology, 2001). [A:III]

Definitions:

Ratings of Importance to Care Process:

Level A, most important
Level B, moderately important
Level C, relevant, but not critical

Ratings of Strength of Evidence:

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  - Well-designed controlled trials without randomization
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- Level III includes evidence obtained from one of the following:
  - Descriptive studies
  - Case reports
  - Reports of expert committees/organization
  - Expert opinion (e.g., Preferred Practice Pattern panel consensus)

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

References open in a new window

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for most recommendations (see "Major Recommendations" field).

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Effective therapy of bacterial keratitis eradicates the causative agent and minimizes structural damage to the cornea, thereby relieving pain, preserving vision, and ameliorating the socioeconomic impact of the disease.

Subgroups Most Likely to Benefit:

Patients fall into four categories of risk factors that predispose them to bacterial keratitis:

- Exogenous factors: contact lens wearers (especially with extended wear lenses); trauma; ocular and eyelid surgery; loose sutures, medicamentosa; immunosuppression (topical and systemic); factitious disease, including anesthetic abuse.
- Ocular surface disease: misdirection of eyelashes; abnormalities of lid anatomy and function; tear film deficiencies, adjacent infection (conjunctivitis including gonococcal, blepharitis, canaliculitis, dacryocystitis).
- Corneal epithelial abnormalities: neurotrophic keratopathy; corneal epithelial edema, especially bullous keratopathy; disorders predisposing to recurrent erosion of the cornea; viral keratitis.
- Systemic diseases: diabetes mellitus; debilitating illness, especially malnourishment and/or respirator dependence; collagen vascular disease; substance abuse; dermatological/mucus membrane disorders (Stevens Johnson syndrome, ocular cicatricial pemphigoid); immunocompromised status; atopic dermatitis/blepharoconjunctivitis; gonococcal infection with conjunctivitis; vitamin A deficiency.

POTENTIAL HARMS

- Collagen shields and soft contact lenses can become displaced or lost, leading to unrecognized interruption of drug delivery
- Potential disadvantages of corticosteroid therapy include recrudescence of infection, local immunosuppression, inhibition of collagen synthesis predisposing to corneal melting, and increased intraocular pressure.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- Preferred Practice Patterns provide guidance for the pattern of practice, not for the care of a particular individual. While they should generally meet the needs of most patients, they cannot possibly best meet the needs of all patients. Adherence to these Preferred Practice Patterns will certainly not ensure a successful outcome in every situation. These guidelines should not

be deemed inclusive of all proper methods of care or exclusive of other methods of care reasonably directed at obtaining the best results. It may be necessary to approach different patients' needs in different ways. The physician must make the ultimate judgment about the propriety of the care of a particular patient in light of all of the circumstances presented by that patient. The American Academy of Ophthalmology is available to assist members in resolving ethical dilemmas that arise in the course of ophthalmic practice.

- Preferred Practice Patterns are not medical standards to be adhered to in all individual situations. The Academy specifically disclaims any and all liability for injury or other damages of any kind, from negligence or otherwise, for any and all claims that may arise out of the use of any recommendations or other information contained herein.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
Living with Illness

IOM DOMAIN

Effectiveness
Patient-centeredness

IDENTIFYING INFORMATION AND AVAILABILITY

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ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2000 Sep (revised 2005)

GUIDELINE DEVELOPER(S)

American Academy of Ophthalmology - Medical Specialty Society

SOURCE(S) OF FUNDING

American Academy of Ophthalmology (AAO)

GUIDELINE COMMITTEE

Cornea/External Disease Panel; Preferred Practice Patterns Committee

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

The following authors have received compensation within the past 3 years up to and including August 2005 for consulting services regarding the equipment, process, or product presented or competing equipment, process, or product presented:

Francis S. Mah, MD: Alcon, Allergan -- Contribution to research or research funds.

Christopher J. Rapuano, MD: Alcon, Allergan -- Ad hoc consulting fees.

Audrey R. Talley-Rostov, MD: Addition Technologies, Allergan -- Ad hoc consulting fees.

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Jayne S. Weiss, MD: Alcon -- Reimbursement of travel expenses for presentation at meetings or courses.

Other authors have no financial interest in the equipment, process, or product presented or competing equipment, process, or product presented.

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GUIDELINE AVAILABILITY

Electronic copies: Available from the American Academy of Ophthalmology (AAO) Web site.

Print copies: Available from American Academy of Ophthalmology, P.O. Box 7424, San Francisco, CA 94120-7424; telephone, (415) 561-8540.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on December 1, 1998. The information was verified by the guideline developer on January 11, 1999. The summary was updated by ECRI on January 29, 2001. The updated information was verified by the guideline developer on March 12, 2001. This NGC summary was updated by ECRI on January 6, 2006. The updated information was verified by the guideline developer on February 9, 2006.

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